THE ELECTRICAL WORLD

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Electric Railways.—III.

(*Continued from page* 165.)

When we say that the motor on the locomotive running on a down grade may therefrom run so fast as to furnish electric energy to the other locomotives on the track, we refer to shunt-wound motors. Series-wound motors only do so under reversal of the magnetic relations of their armatures and field magnets.

For illustration: Series-wound motors and dynamos are alike in all particular of winding, but they run as motors in a direction opposite to that which is imparted to them as dynamos. No speed in the direction of their running as motors will produce a current—*i. e.*, with series motors as they have been constructed. This is probably on account of the movement in the direction of rotation of the polar line crossing the armature from field-pole to pole. If the poles of the field magnets and those they induce in the armature could be kept on one line, instead of the armature poles being deflected therefrom by the current, as is approximately the case in shunt-wound dynamos of recent construction, there would be no movement of them as motors, because the opposite poles would then be as mechanically near to each other as possible, and could approach no nearer.

With a strong current flowing in an armature of a Gramme or Siemens type of motor, the poles resulting from the current tend to be formed at an angle of 90° from the line of the poles induced by the field magnet, but the actual poles take up a resultant position between these two. As the current flowing through the motor decreases by reason of the counter-electromotive force set up by the rotation of the armature, the armature poles move nearer to the field-magnet poles until they reach the line joining the latter. The motor then is in exactly the condition it would be as a dynamo from which we are trying to get electric current by running it in the direction of a motor. No speed imparted to it by fast running of a locomotive on a down grade would cause it to produce a current which it is necessary for it to produce in order to contribute electric energy to the circuit.

If, however, we reverse, by any means, the ends of either of the parts of the circuit to armature coils or to field-magnet coils, so that their relative polarities under a current are reversed, the motor thus converted to a dynamo by this electrical and magnetical reversal, instead of a mechanical reversal of direction of rotation, immediately contributes current carrying electrical energy to the circuit, provided there is another motor on the track to receive the energy. If there is not, and the dynamo at the station is a shunt-wound one, the return current from the motor-dynamo being of greater electromotive force than that from the dynamo, passes into the field-magnet coils, and consequently increases the magnetism of the field, and therefore the electromotive force of the current from the dynamo to balance that of the motor-dynamo.

Running the motor as a dynamo requires energy, and this energy being derived from the movement of the locomotive, is just so much a retarding force against the speed of the locomotive. But we have seen that the tendency is for the two, dynamo and motor, to equalize their electric conditions. Therefore, where the grades are heavy on an electric railway, the locomotive must be supplied with some other means of controlling its speed on down grades than the counter-electromotive force of the motor. These means are easily obtained, by providing apparatus by which the current from the dynamo may be switched from the motor, the motor reversed, and then short-circuited on itself. The h us constituted series-motor-dynamo will act as a most efficient brake against the motion of itself and of the locomotive, as all know who have put a simple series-dynamo on short circuit while at full speed and running an arc-light circuit, for instance.

An electric locomotive, then, needs no brake, such as we are familiar with on steam railways, nor does it need an electric brake other than its own motor. A steam locomotive engineer, in emergencies, reverses his engine and applies his brakes. The electric locomotive engineer will reverse his brushes, or reverse a switch to his field coils and make his short circuit, and thus apply a brake which works without friction, and is the more powerful the greater the speed and emergency. A light brake may be needed for use at times of slow speed, unless the locomotive be supplied with arrangements before referred to for varying the relative speeds of motor and locomotive wheels. The energy made active by the movement of the train on a down grade was stored up during the ascent of the locomotive and train, but is lost in descent under this short-circuiting arrangement we have described. If there are other motors on the track in a multiple, or parallel, system, and they be not all on down grade at once, those which are on down grade will give out their stored energy to those on level or up grade.

Electric storage batteries may be used on the circuit or on the train to receive the energy made active by descent of the motor, and to return it when needed for ascent or for other purposes, such as lighting.

On an electric railway, where the trains are placed in electric series, the conditions are somewhat different. The dynamo at the station is operated so as to keep up a constant difference of potentials at the binding posts. Any motor on the track running above or below the normal speed necessitates a readjustment of the electrical tension of the current at the dynamo, so as to keep the current at the desired number of ampères. This being the case, the current flowing through the motors is the same in value at each one, whether running fast or slow. Therefore, if compensating devices were not provided, the motor on down grade would receive energy to drive it to destruction, because energy is required to move the motor on up grade. But if we provide a shunt around the motor on down grade the main current will flow through it without contributing energy to the motor, and the motor will move on without any mechanical resistance, except the little due to the movement.

It is, however, necessary, as we have seen, to provide some means whereby the motor itself may act as its own brake under the condition assumed. If, then, we provide a switch or lever by which we may reverse the connections on the motor, as before considered, we make a dynamo of it for the time, and it acts to send a strong current through its short circuit without contributing to the main current, and thus raises its magnetism and consequent brakeing power.

Now, if we provide means whereby the short-circuiting shunt may be thrown out of the circuit while the motor is on down grade, and the motor connections are such that in the direction it is moving it acts as a dynamo, it will contribute energy, stored up on the up grade, to the general circuit. As it supplies electric energy, which is derived secondarily from the momentum of descent, the rate of descent must be retarded; so to that extent the motor acts as a brake.

From the above considerations it seems necessary to provide a motor on a series electric railway with a shunt around it of variable resistance, means of varying that resistance from zero to infinity, and with switches for reversing the connections so as to have it run as a motor or as a dynamo.

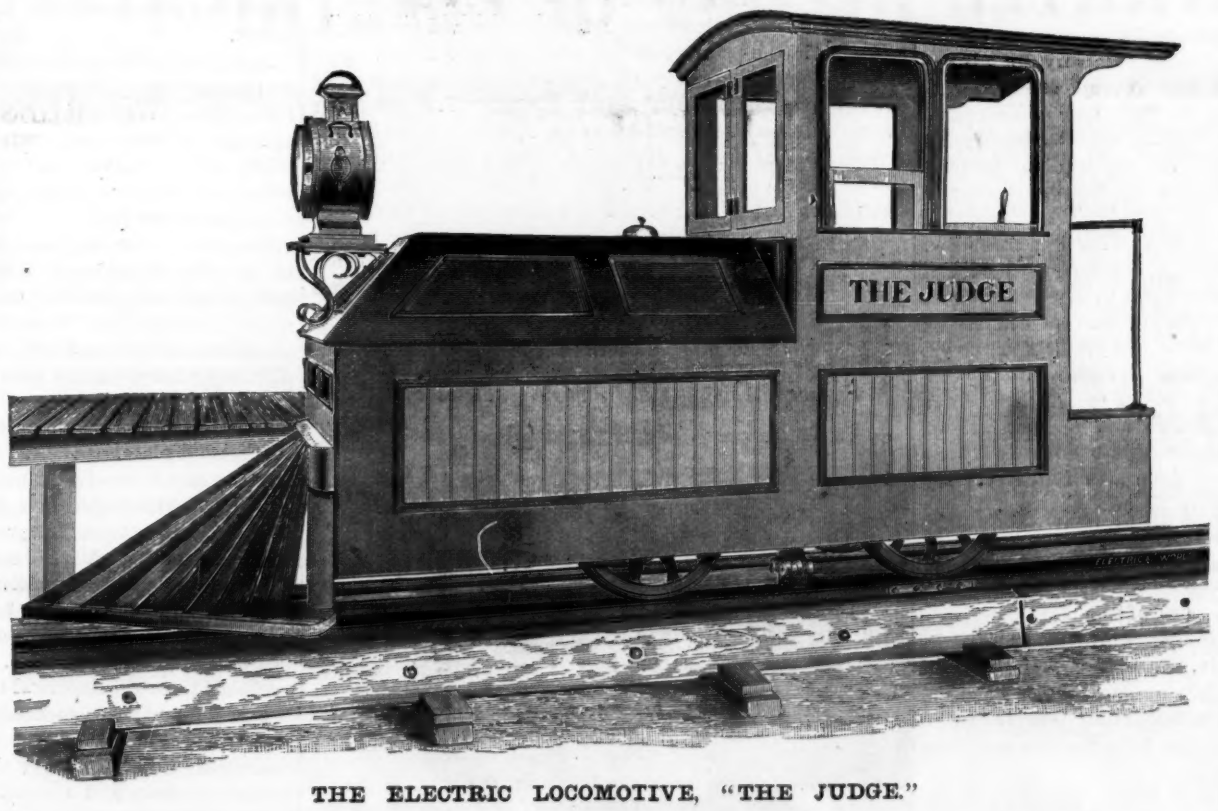
On starting such a motor the current will be admitted to it gradually by increasing the resistance of the shunt to infinity—*i. e.*, until entirely withdrawn. On up grades or for heavy loads this condition of parts continues. But if the speed rises too high the resistance of the shunt is decreased, so that more current flows around the motor instead of through it. This withdraws some of its supply of energy. If speed increases to an undesirable degree, as on down grades, the resistance of the shunt is decreased even to zero, and then, if the speed is too great, the connections are reversed, so that the motor becomes a dynamo and sends current to the short circuit and its own field to act as a brake. But if this stoppage be not desired the resistance is increased to its greatest extent, or infinity, so that the motor dynamo contributes electric current energy to the main circuit.

That electric energy which is so contributed to the circuit lessens the duty of the prime motor and dynamo to an equal extent.

The illustration we present herewith is a view of the electric locomotive "The Judge," which was used at the Chicago Exposition in 1883, and fully described in the issue of THE ELECTRICAL WORLD, dated August 4, 1883.

It carried 28,000 people during the Chicago Railway Exposition then, and was also a great attraction at the Louisville show last year, working admirably at both places, and leading many persons to believe that in a few months the electric railway would no longer be a novelty in any part of the country.

Q.



THE ELECTRIC LOCOMOTIVE, "THE JUDGE."

(TO BE CONTINUED.)

A Singular Coincidence.

It is a singular coincidence, whether significant of the future of the enterprise or not, remarks the Boston *Herald*, that the first successful step in the Bennett-Mackay, or Commercial Cable, enterprise comes on the anniversary of the first practical demonstration of the possibility of the electric telegraph. It is just forty-one years ago to-day that Professor Morse accomplished the aim of his life in having constructed or completed the first working telegraph line in America, between Baltimore and Washington. The trials and tribulations of that noble pioneer inventor and telegrapher of 1843, in building a simple land line of forty miles, stand out in marked contrast with the system and ease with which even two great continents are now joined by the electrical devices of such ingenious and persevering sons of Massachusetts as Professor Morse, of Charlestown, and Cyrus W. Field, of Stockbridge. Telegraphs and ocean cables might have come if these men had never been born, but it cannot be denied that but for the indomitable energy of these Yankees their realization would have been long delayed.

Telegraphs in Philadelphia.

Our Philadelphia correspondent writes us as follows :

City Councils having appropriated $10,000 for the purpose, the city authorities are just now introducing the police, fire and telephone system which has proved so successful in Chicago. The contract includes a number of street stations, or watch boxes, with telephonic communication with the Central Police Station, ambulance wagons, and full sets of instruments.

A number of the banking houses of the city are dissatisfied with the present system of police protection, and are advocating the adoption of a system which will place all the banks in connection with Police Headquarters, both by telegraph and telephone.

It has been demonstrated lately that Philadelphia is not to get rid of her aerial lines as quickly as some of her citizens thought she would. The City Fathers have been very energetic in demanding that the various companies shall put their wires underground ; but, when it becomes plain that the city's wires must go underground too, the Superintendent of the "City Electrical Department" (that is the new name for the old Police and Fire Alarm Telegraph) has suddenly discovered that it would cost over half a million dollars to bury all the city's wires; and, furthermore, even if the work were commenced immediately, it would be almost impossible to be in readiness to comply with the ordinance which requires that all telegraph, telephone and electric light wires shall go underground by the year 1885.

So much trouble has been caused recently by "crosses" on the fire alarm wires that the officials have notified all the companies that hereafter they must have all their wires placed at least four feet above those belonging to the city under penalty of having them cut.

Opposing the Commercial Cable in France.

The Paris papers announced on June 1 that M. Bouchet, Deputy for Bouches-du-Rhone, intended at an early date to put a question to the Minister of Posts and Telegraphs regarding the concessions to the Commercial Cable Company. A correspondent at once called upon M. Bouchet, and was most courteously received by him. In reply to a question, M. Bouchet made the following statement : I am going to do my best to dissuade the Government from according a concession to any cable company not administered and worked by Frenchmen and subjected to French inspection and control. There already exists considerable uneasiness in French industrial circles as to the concession to a foreign company, which is believed to be prejudicial to French interests. There is a general feeling, especially among my constituents, that the Ministry is not exacting the most advantageous terms from this foreign company. Personally I am in most agreeable relations with M. Cochery, but the matter is too important to my constituents not to insist on having the whole question placed before the Chamber of Deputies. I have not yet decided how I shall bring the matter on for debate ; probably on the discussion of the appropriations, in about ten days. I have the greatest admiration for America and her institutions, and I especially approve of the energetic efforts of your politicians in protecting native American industry. My object is merely to protect native French industry.

Notes from Brazil.

Summarizing the annual report of the Companhia de Telegraphos Urbanos, of Rio de Janerio, the *Anglo-Brazilian Times* says: Unfortunately, the Companhia Nacional de Electricidade of which the other company is a licensee, has not been able to induce the telegraph department to permit of telephone communication between Rio and Petropolis.

The company had on the 31st of March 776 lines working, viz: 627 in Rio, 95 at S. Paulo, 33 at Petropolis and 21 at Nitherohy, and applications were on file for 601 more. In March the Rio lines alone transmitted 113,424 calls, equal to over 1,350,000 a year.

In January the telegraph department exacted that the putting up of all new lines should be effected only by that department and, in consequence, the work was transferred to the department, giving rise to delays in attending to new applications. The company has in stock 250 telephones, 10,000 kilograms of galvanized wire, etc., of the value of $32,000, and has ordered from England 4,000 metres of insulated air cable having seven wires.

Activity of the Western Electric Company.

The Western Electric Company are at work, says the Chicago *Industrial World*, upon four miles of cable logs to go to Antwerp, Belgium. They are making a new multiple-switch board for the Bell Telephone Co., of Canada, for their Toronto exchange, which has recently had to seek new quarters on account of fire, are placing an additional outfit of electric lights in the Palmer House in this city, of which a cluster will be displayed on the tower of the hotel, and are fitting up McCoy's new European Hotel (city) with lights and a complete fire call system. They will put in a complete electric light system in C. Jevne's new city store.

Ducousso's Telephone.

Generally, in telephone stations the induced currents which transmit speech pass through the fine wire bobbin of the induction coil and the bobbin of the receiver. But the transmission may take place through the fine wire of the induction coil at that end, and the reception take place with the receiver in the circuit without the induction coil at its end. Hand-worked switches which permit the operator to place the receiver and transmitter in their appropriate circuits have been abandoned. It is probable that by reason of the increased tension of telephonic currents the resistance of the bobbin of the induction coil at the receiving end, and which is uselessly in the circuit, does not sensibly weaken the intensity of the currents; but those bobbins which are provided with permanent-magnet cores may injure the distinctness of hearing by reason of the reaction of those cores on the bobbins.

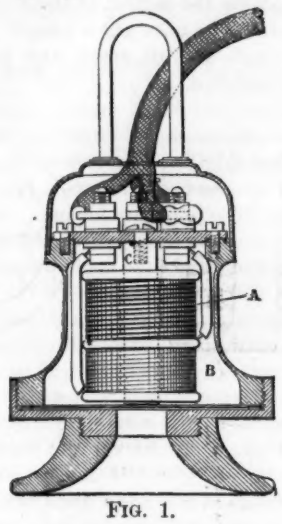


FIG. 1.

The telephone made by M. Ducousso is placed so as to utilize the fine-wire bobbin, both for transmission and reception. The instrument is composed of a soft-iron core *C*, which presents one end to the usual diaphragm, also of soft-iron. On the core is wound a bobbin *B*, of fine wire, which is connected to the circuit line. Alongside of this bobbin another bobbin *A*, of coarse wire is wound, and is connected to the microphonic transmitter and battery, in series, as in the primary of the usual induction coil.

Variations of intensity of the current in the coils of *A* cause variations in the induced currents in *B*, through the intermediation of the soft-iron core *C*, which is the seat of a variable magnetism depending upon the variations of the primary current. At the receiving end, the microphone being silent, the core *C* is magnetized to a constant strength by reason of the constant current in the bobbin *A*. But the currents from the transmitter at the other end of the circuit vary this magnetism, and the diaphragm is correspondingly operated.

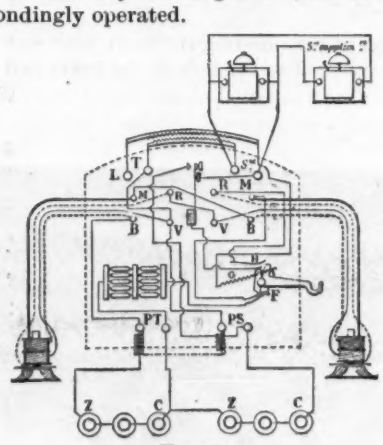


FIG. 2.

In stations where two receivers are used the fine-wire bobbins of both are placed in series ; and the same is the case with the two coarse-wire bobbins. But in some cases it may be preferable to place the fine-wire bobbins in parallel and the coarse-wire bobbins in series. Or, better still, two batteries and one transmitter can act on the two receivers.

The absence of a steel permanent-magnet core makes the construction of this apparatus more simple and more convenient. It is very light and of graceful form.

The inventor claims for his apparatus the following advantages :

1st. Suppression of the steel permanent magnet.

2d. The arrangement of parts permits complete utilization of the internal resistances in both transmitter and receiver.

3d. Facility with which the bobbins may be grouped in parallel or in series. We translate the foregoing and reproduce the figures from *La Lumière Electrique*. □

TELEPHONIC FIRE ALARMS.—Philadelphians have just had a striking example of the value of the telephone in cases of fire. When the Atlantic Oil Refinery at Point Breeze, some miles from town, was struck by lightning on the 23d ult., the alarm was sent out from the Bell Telephone Exchange at 10:24 P. M., which was ten minutes before the regular fire alarm box was struck at Point Breeze. This is significant in regard to the usefulness of the telephone in cases of fire. The city of Chester, Pa., about fifteen miles south of Philadelphia, has adopted a telephonic system of fire alarms.

Bourseul and Bell.

The general impression having at all times been that Reis was unacquainted with Bourseul's ideas relating to the electrical transmission of speech, and that he was an original inventor, the following article from the *Didaskalia*, a semi-weekly printed in Frankfort-on-the-Main, (the abode of Reis from 1848 to 1854), a paper devoted to belles lettres, arts and sciences, and which in its time had a large circulation throughout Middle and Southern Germany, will be interesting to all electricians.

The article is from the 32d volume of the *Didaskalia*, in No. 232, and the issue bears the date Thursday, September 28, 1854.

The undersigned has prepared a verbal translation of this remarkable document and through the kindness of the editor of this paper has commented on it in another column of this issue. E. BERLINER.

DIDASKALIA. 32d volume. No. 232. Frankfort, Sept. 28, 1854. *Electrische Telephonie.*

The wonders with which electricity has surprised us lately, will, as it seems, be augmented by a new one which will not only produce a revolution in the present electrical telegraphy, but will also enhance its utility in an incalculable manner. It concerns nothing more or less than the electrical transmission and rendition of the *spoken word*. The idea originated with a young and modest but educated man, Charles Bourseul, who in 1848 was a soldier of the African Army, where he made himself observed to the Governor-General by a mathematical course which he gave to his comrades of the garrison in Algiers ; he now lives in Paris. Perhaps Bourseul's problem, of the feasibility of which he is perfectly convinced, belongs to the line of those discoveries which the learned world afterward declares as very simple, and of which they would then make us believe would have been found out much earlier if they would have taken the trouble (to find it). As we know, the principle on which electro-telegraphy is founded is the following :

An electric current circulating in a metal wire transforms a piece of soft iron with which it comes in contact (?) into a magnet. As soon as the current ceases, the magnetic quality gives way. This magnet, the electro-magnet, can therefore alternately attract and let go a movable plate which, by its motion of coming and going, produces the conventional signs which are used in telegraphy.

It is furthermore known that *all* tones are communicated to the ear merely by undulations of the air, being, therefore, themselves nothing but these undulations of the air, and that the differences (without end) of the tones depend solely and exclusively on the rapidity and the strength of these sound-waves. If now a metal plate could be invented so movable and flexible as to render all the tone undulations equal in the air, and if this plate be so connected to an electric current that it would alternately make and break the electric current according to the air undulations by which it is struck, then it would be possible to cause a second similarly constructed plate to electrically repeat at the same time exactly the same undulations as the first plate, and it would therefore be the same as if a person had spoken in the immediate neighborhood against this second plate, or the ear would be affected in the same manner as if it received the tones communicated through the first metal diaphragm (*mettallwand*=wall, partition, E. B.) The electrical telegraphy which at the time was stamped, academically, almost as nonsense, now traverses the whole world as a familiar phenomenon. If we consult, in regard to this new idea of a young physicist, the principles of physics, we have not only nothing to say against the possibility of its execution, but its success seems more probable than did electrical telegraphy not long ago.

If the experiment succeeded, then electrical telegraphy would have become quite good; it would require no other machinery and knowledge than a galvanic battery, two vibratory plates and a metal wire; without further preparation one person would have only to speak against the one metal plate and the other person to hold his ear to the other, and thus they could converse one with the other as under four eyes (*unter vier augen*=personally).

The young inventor believes in the success of his endeavors and challenges the learned men to prove that the laws of physics are in contradiction with the above recited principles, and that they let appear impossible what is looked for.

In the meantime this matter would deserve the attention it will receive, in the highest degree.

(Signed) L.

Exit Reis.

To the Editor of The Electrical World :

SIR : In ancient Rome there was at one period a law forbidding the erection of a monument to a man until one hundred years after his death.

The meaning of this law was no doubt to wait before immortalizing the work of a citizen until a good general aspect and a broad view of the true value of his life could be obtained by looking at him from a distance. It is too often the case with men's judging a person or a cause, that they are in the position of the peasant boy who could not see the forest on account of the trees. Views are narrow, the horizon is limited and they lose sight of the great panorama of life and progress, and imagine that it is their own

work and sphere around which revolves everything else. On the other hand, the true value of a man's life is often not recognized until many years after his death. But worse than the errors arising from a natural narrow-mindedness is the practice of many of the genus *literarius* to paint before the eyes of their readers an artificial perspective, to use the richness of language, the flexibility of syntax and the wiliness of misapplied and overturned philosophy to enhance the scenery and to put the glare of a calcium light and the romance of a stage moon as a halo behind the heads of their heroes. Let on the daylight of investigation and ventilate with a short blast of logic, and the true inwardness of the charming romance is laid bare. Witness Louise Muhlbach's touching historical novels and turn upon them Carlyle's studies and criticism. The monuments were only sticks and pasteboard and fall into a dozen pieces when you draw the pedestal from under them.

When you, Mr. Editor, in the issue of THE ELECTRICAL WORLD, of October 6, 1883, said: "In a controversy of this kind (the Reis-Bell) it is never too late to take evidence," I did not dream that so soon afterwards I should come across an old semi-weekly newspaper published at Mr. Reis' doorsteps, and which, printed fully five years before he commenced original researches, contained, under the heading "Electrical Telephony," nearly the whole of the scientific arguments, though in sketch-like brevity, which in 1861 Mr. Reis gave out in his well-known lecture.

This article, which by your kindness is printed in another column, written by one signing himself "L," and which appeared on Thursday, September 28, 1854, in the *Didaskalia*, a paper printed in Frankfurt-on-the-Main, and widely read throughout Germany, contains so lucid a description of Bourseul's idea of a telephone that any mechanic knowing how to harness electricity can produce from the ideas given a musical telephone.

And five years afterwards we find Philip Reis make such apparatus and say that he invented it and named it "telephone."

In order to be able to judge this most strange part in the history of this most remarkable invention I beg to place before the reader an abstract from Prof. Sylvanus P. Thompson's book, "Reis; the Inventor of the Telephone," and which book I have had the pleasure ere this to comment on in the columns of THE ELECTRICAL WORLD.

According to Professor Thompson's original researches:

Reis was born in 1834.

"Went to Frankfort in 1848."

"Became a member of the Physical Society of that city in 1851, and remained three years a member thereof."

"In the winter of 1854–5 we find him most zealously busied with preparations for carrying out his decision to become a teacher."

"In 1855 he went through a year of military service at Cassell."

"It was during this time (1859) that Reis undertook the first researches of an experimental nature."

"In 1859 he sent a paper to Prof. Poggendorff, entitled: 'On the Radiation of Electricity.'"

The other piece of original work undertaken at this time was the research which resulted in his great invention—the telephone. From the brief biegraphical notes written by the lamented inventor in 1868 we extract the following:

"Incited hereto by my lessons in physics I attacked a work begun much earlier concerning the organs of hearing, and soon had the joy to see my pains rewarded with success, since I succeeded in inventing an apparatus by which it is possible to make clear and evident the functions of the organs of hearing, with which also one can reproduce tones of all kinds at any desired distance by means of a galvanic current. I named the instrument 'Telephone.'"

What I now ask is:

Can we assume that Reis, belonging to the cultured class of a city of 60,000 inhabitants, did not read a semi-weekly paper of that city devoted to belles lettres and daily events?

Can we assume that Reis, having been from 1851 to 1854 an active member of the Physical Society and leaving Frankfort in 1855, did not read or hear of the wonderful and novel ideas presented in Frankfort in September, 1854, under the name Electrical Telephony?

Shall we assume that Reis wrote the article himself over the signature "L," and afterwards ignoring Bourseul, took all the honor to himself?

But even assuming the latter case for a moment, how can it be explained that instead of employing the powerful alternate attraction and release of a diaphragm by an electro magnet for a receiver, so plainly hinted at in 1854, he, in 1860, resorted to the feeble vibrations of a needle core?

Here are enigmas which Prof. Thompson can possibly unravel. But to save Reis' good name, let us assume that he either hastily read or heard of the article, that with most of his colleagues he shook his head at the idea of transmitting speech by electricity, and that fully five years afterwards, having completely forgotten about it, the idea unconsciously re-occurred to him and was this time judged by him with a mind more mature for physical researches and more free of other immediate changes and aims. But whatever conclusion we arrive at, Reis cannot be taken as the inventor of even the musical telephone. This honor belongs entirely to Bourseul, and Reis was practically only Bourseul's assistant and merely carried out the mechanical parts of the problem.

Prof. Thompson closes the preface of his book with the sentence: "When the jubilee of Reis comes to be celebrated in 1884, the world will find out its indebtedness to the great man whose thoughts survive him."

Does the reader who has followed my controversy with Prof. Thompson in its scientific and logical, and presently in its historical bearing, comprehend now the wisdom of the ancient Roman usage, not to erect a monument to a man until 100 years after his death?

We will at any time have a word of welcome for Prof. Thompson for any of his "original researches," but had they not better remain confined to experimental physics?

Reis was after all only the foster father of the "child in the wilderness."

E. BERLINER.

WASHINGTON, D. C., May 31, 1884.

The Altandi Magnet.

BY PROF. A. K. EATON.

In an interesting article on electro-magnets, by the well-known electrician, J. T. Sprague, in a late number of the *English Mechanic*, the writer refers to the 'altandi' magnet in the following words:

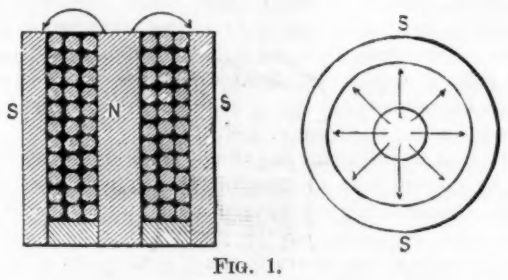


FIG. 1.

"A few years ago great claims were made as to the advantages of surrounding the helix with an external tube of iron connected to the core at the lower end by a disc of iron. This was patented under the name of the "altandi" magnet—a barbarous word invented to convey some idea of exultation; but the construction had been frequently employed before. Figure 1 will explain it.

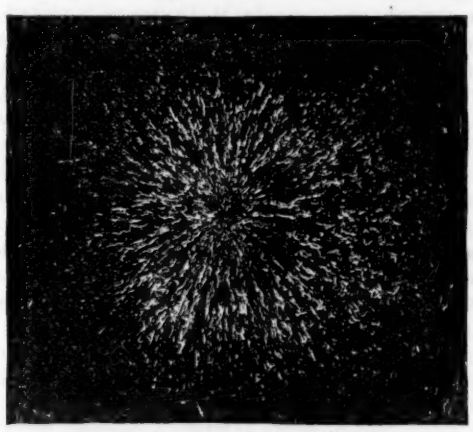


FIG. 2.

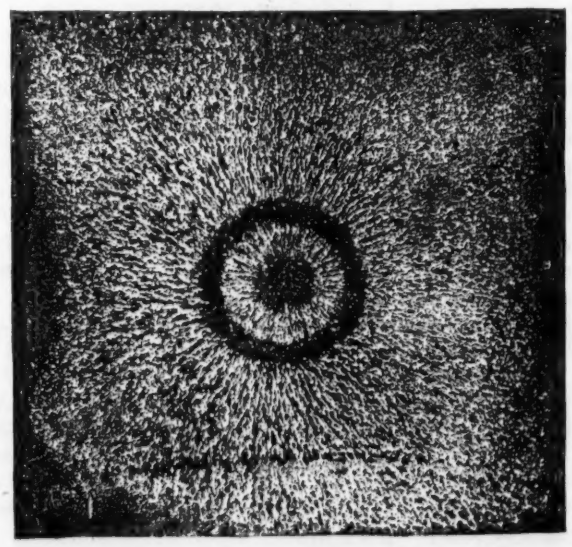


FIG. 3.

"It will be seen that though there is only one core this is still a true horse-shoe magnet, the other arm being a cylinder surrounding the core. The effect is to produce an intense, but very limited field, represented by the arrows, giving, no doubt, great holding power, but with attraction exerted only at a small distance."

It is with no disposition to be hypercritical that I call attention to the error involved in the view thus taken of this peculiar magnet, for I myself fell into the same error and accepted this view until compelled by facts to reject it.

Some six years in connection with telephonic researches I had occasion to make several magnets of this form, and, at first, assumed naturally that it was a "true horse-shoe magnet," the central bar being one arm, "the other arm being a cylinder surrounding the core." During my experiments, however, I found that this was not true. When I tested the magnetism of the two poles it was found that, while the central core became highly magnetized by a current passing through the helix, the external tubular arm was practically free from magnetism—neutral in fact—with not sufficient lifting power to take up iron filings.

For the purpose of making further demonstrations as to the character of this electro-magnet I constructed one that was dissectable. The inner arm could be removed, leaving the helix and outer cylindrical arm, or the cylinder might be removed, leaving the core and helix, etc. The following tests were made with the magnet in its different modifications.

A spectrum of the lines of magnetic force, produced by means of iron filings upon glass, in the usual way is given in Fig 2. This was obtained from the end of the complete magnet when charged. The outer cylinder was removed, and another spectrum produced, at the end of the core Both spectra were alike and it was readily seen that they were precisely the same as that produced from the end of any straight-bar magnet.

Replacing the cylinder, a coil of wire wound outside of the cylindrical arm and so connected that the current passing through the core helix, passed through the outer coil also and in a direction the reverse of its course through the inner helix, the spectrum then obtained is represented in Fig. 3.

In this case it became in principle, a "true horse-shoe magnet," with two adjacent poles of an opposite character. The outer coil being removed and the iron core withdrawn, upon passing the current through the inner helix no magnetism was exhibited by the cylinder, and no spectrum formed.

With the magnet complete and charged by the current, the lower end, at the junction of the core with the cylinder, always manifests considerable magnetism of a polarity opposite to that of the outer end of the core. As this should be the neutral point of the magnet it is evident that it does not act as a "true horse-shoe magnet."

In view of these facts, I think we must conclude that the "altandi" magnet is in effect a straight-bar electro-magnet in which the cylinder only acts as a part of the armature whenever a piece of iron connects the core and cylinder.

NEW YORK, June 2, 1884.

Telegraph Litigation.

Litigation of an earnest and varied character is now pending between the Western Union and the Baltimore & Ohio Telegraph Companies. Each company has enjoined the other against putting up poles and stretching wires in certain described sections of this city, and motions concerning these injunctions will be argued in Supreme Court Chambers at a very early date. Dillon & Swayne will appear for the Western Union and Edward R. Bacon for the Baltimore & Ohio.

Officers of the latter company allege that it has been the policy of the Western Union Company ever since its formation up to the present time, to cripple rival lines to such an extent as to prevent them, if possible, from stringing their wires through the streets of the larger cities, and from connecting such cities by telegraph. "To achieve this end," said a gentleman interested in the Baltimore & Ohio line, "the Western Union has monopolized every available space on every desirable street in this city, and has erected flimsy poles strung with a few rusty wires, thus securing to itself a right of way."

The gentleman explained that Second avenue was the thoroughfare selected by the Baltimore & Ohio Company along which to build a portion of its new line to Boston. The line has already been completed on the east side of that avenue from Fourteenth to Thirty-first street and from One Hundred and Tenth street to the Harlem River. The Western Union Company procured an injunction preventing the erection of its rival's lines on Second avenue between Thirty-first and One Hundred and Tenth streets, on the ground that the new poles interfered with the crossing of the Western Union wires. After obtaining this injunction, it is alleged that the Western Union Company began erecting exceedingly lofty poles (85 feet high) on Second avenue between the streets last mentioned. They had time to put up two such poles, when they in turn were enjoined by the Baltimore & Ohio Company, the latter declaring that the lofty poles were being erected solely for the purpose of obstructing the new line. This last injunction was obtained at 7 o'clock P. M. on May 24.

The Western Union Company is also accused by the Baltimore & Ohio Company of attempting to play a block game on Eleventh avenue, between Forty-second and Fifty-first streets. Through this avenue the Baltimore & Ohio are endeavoring to erect a second line to Chicago. It already has one line in operation to that city, running along the West Shore and Nickel Plate railroads.

Besides the suits already referred to there are three other litigations now pending between the Baltimore & Ohio and the Western Union. In one suit the Gold & Stock Telegraph Company appears as plaintiff. A motion in this suit will also be argued in the same place as the other suits and by the same lawyers.

THE
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COMPETING CABLES.

It may be remembered by some of our readers that when Mr. Pender was in this country he took occasion to congratulate the cable companies on their "freedom from the dread of more cables." Such congratulations would seem a little forced and out of place to-day. The Commercial Cable Company, or Messrs. Bennett and Mackay, have already succeeded in laying the first section of one of their cables, and the steamer "Faraday" is now on her way toward Ireland paying out cable as she goes. By last reports from her, the thousand miles of cable which she has on board will all have been laid within a few days. It appears that by laying the longer deep sea-section from Nova Scotia eastward the "Faraday" enjoys advantage that would not have been attainable had she reversed the order and laid the cable from Ireland westward. She avoids, or feels only with mitigated effect, the gales that sweep the Atlantic at this season of the year from west to east, and it follows that the cable, as it is paid out, is not subjected to so severe a strain. She is also passing rapidly out of the region in which she might experience serious collisions with drifting ice.

It is also claimed for this cable that it will lie snugly at the bottom of the sea, stretching along the sea floor to the submarine plateau that divides the North Atlantic longitudinally into an eastern and a western valley, serving as a water-shed, if one might use the term, and rising to within fifteen hundred fathoms of the surface of the ocean. This plateau is known as the Dolphin Rise, and its outlines are now fairly well known, owing to the soundings made by the Siemens Brothers from one of their own cable steamers. There the end of the cable will be buoyed until the "Faraday" can go to London and return with a fresh supply of cable. The public is promised that as soon as the one cable shall have been laid, the Commercial Company will begin operations.

These facts, and the knowledge that Messrs. Mackay and Bennett are determined men with ample means, who have resolved to see the thing through, account for the change of front and the "dread of more cables," now shown by what is called the "cable ring." In our last issue we stated that the cable companies forming the "pool" were now organizing for better competition against the new enterprise, and that they had agreed to make a united effort to crowd their opponents out of the field by charging the extraordinarily low rate of six cents per word as soon as the new cable is ready for business. Apparently the Commercial Cable Company are not intimidated. As a response to this challenge, they say that their cable, which will be complete and in good working order about the middle of next month, will carry messages for the public at this rate of six cents, and will be far more able to keep up the struggle on that basis than the other companies with their inflated stock and old cables. At the same time, preference will be given to full-rate messages—by which we suppose is meant messages at twenty-five cents per word—in the order of their filing. But the *Herald* people assert that even if public patronage were largely drawn away from the cable, they could still find constant employment for it; and if Mr. Bennett intends, as rumored, to start a daily *Herald* on the other side, we can easily understand that outside business would be of secondary importance. It may be expected, however, that the new cable will at least take its share of all the business going, and this share has been sanguinely figured out at five million words per annum, or ten million words for the two Commercial cables. It has been arranged that after the business handed in by the public, shall come, in the order of transmission, press messages, other than those addressed to the *Herald*, and that that paper's dispatches, except those of an urgent character, shall form a third and last class. As it is put by the *Herald* people themselves, they will "jump in" with their own messages at all spare times, not allowing the cable to have a single idle moment. It seems to us that at the low rate of twenty-five cents per word there should to-day be an enormous increase of traffic, and still more so at the bed-rock rate of six cents. Cable codes are a great convenience, but they are sometimes a great nuisance, and there are a great many men who would willingly send long messages at the lower rates, in full, rather than condense them with the aid of codes, and run the risk of costly mistakes. Codes are not adopted so much for motives of secrecy as to keep down the expenditure for ocean telegraphy.

We note in this issue the threat made by a French deputy to do his best to dissuade the French government from according any concession to the Commercial or other new cable company, on the ground that as the concession is made to foreigners it must perforce be prejudicial to domestic interests. Probably this attempt will come to naught. The deputy might remember, however, that a cable has two ends as a rule, and that even should all the cable companies of the world be French, one end of each cable would generally land on soil over which the tricolor does not wave. If it came to a game of tit for tat, he might find that the principle insisted upon would work to the disadvantage of his own country. Practically, the operating of cables, except in times of war, is an international matter, and all countries bordering the sea have an interest in the multiplication of them. This was recognized by the late International Convention at Paris for the protection of submarine cables, attended by plenipotentiaries representing full twenty nationalities; and two fundamental provisions to which assent was given, to be binding upon all, were legal ownership and international protection. Each of the contracting powers has engaged to further measures securing the punishment of any persons who violate the provisions of the Convention.

"TRICKS OF THE TRADE."

The Baltimore & Ohio Telegraph Company did a big stroke of work last week in taking a crowd of more or less hungry newspaper correspondents to Chicago on the "dead-head" plan. The Queen City Hotel, at Cumberland, Md., never did as much justice to the B. & O. Company as she did on the 30th ult., when the festive correspondents wondered whether they would drink more wine or eat more squab. But there was a point finer than that when the B. & O. R. R. Company consented to carry the scribes to and fro in palatial cars for nothing, and feed them and house them on the side tracks in Chicago, also for nothing. It is easy to see that a newspaper man who has 10,000 or 15,000 words a day to send by telegraph can, when boarding at a city hotel, use the telegraph line that suits him best; but that when he eats and sleeps on the B. & O. cars, at their expense, he cannot do less than throw his business, worth a hundred dollars a day, in the way of the B. & O. Telegraph Company. This special-train-picturesque-route-free-lunch excursion was a great stroke of business; and the only missing factor is a list of the great "independent" papers that were represented as dead-heads.

We observe, too, that the Western Union Company have now a special wire from the nearest point to the residence of each of the Presidential candidates before the Chicago Republican Convention, a little bit of enterprise that must, in view of the number of candidates, pretty well duplicate the Western Union system. One special effort of this company worthy of serious note, however, has been the stringing of two additional wires between this city and Chicago, for the heavy business of the Convention. The length of line is about 1,100 miles, but the entire work was done in ten days.

From the earliest days of the telegraph, national conventions have always been looked upon by the telegraph companies as a means of special advertisment. The first public message sent to Mr. Morse by his assistant, Mr. Vail, was, it is said, on the occasion of the meeting of the National Convention at Baltimore to nominate for the Presidency. James K. Polk was nominated for the office, with Silas Wright as Vice-President. Morse conveyed the news to Wright, in Washington, and when Wright declined, Morse sent back word to that effect over the wire to Baltimore. The unsophisticated Convention was immensely surprised at this prompt response, and refused to believe that the information was authentic until a committee had proceeded to Washington and confirmed the first message by a second message of their own. As might be expected, this incident did the telegraph good by bringing it prominently before the public.

The American Union Company contrived to get a splendid advertisement out of the nomination of Garfield. They were anxious to attract public attention, and the Republican Convention put an opportunity in their way. Balloting had, as usual, gone on for some time, when a private message to Mr. Childs, of the Philadelphia *Ledger* was handed in, informing him that Garfield would be nominated on the next ballot. Taking the risk boldly, the company at the fitting juncture announced the nomination of Garfield at several points in the city and sent the information all over the country. Soon after, the Western Union announcement came along, but the American Union had meanwhile reaped all the glory of priority.

This is a week of tremendous strain for all telegraphers, especially those in Chicago, but we have no doubt they will pull through. Some idea of the amount of press matter to be forwarded can be gathered from the fact that at the beginning of this week, between 600 and 700 applications for seats at the Convention had been sent in by newspapers in all parts of the country.

"TELEGRAPH" AND "TELEPHONE" AS LEGAL SYNONYMS.

In connection with the Underground Wire bill, now before Governor Cleveland, it has been contended that its title is such as to render the provisions inapplicable to telephone lines. The following opinion of the Queen's Bench Division, given in the case of the Attorney-General vs. Telephone Company of London, and accompanying a unanimous decision for plaintiff, has been furnished us as bearing on the question whether "telegraphy" and "telephony" mean the same thing legally or not.

"Though for scientific purposes it may be necessary to distinguish between telegraphs and telephones, it seems to us that the word telegraphs, as defined in the act, is wide enough to cover every instrument which may ever be invented, which employs electricity transmitted by a wire as a means for conveying information. * * * Webster's Dictionary, edition 1856, page 254, defines "telegraph" as "an instrument or apparatus for communicating words or language to a distance by the use of electricity."

"Suppose a company erect posts along a highway, and suppose the body having control of the highway gave their consent. Would the validity of their consent and therefore the liability of the parties concerned to an indictment for obstructing the highway be dependent on the question whether the messages were sent by transmitter or key?"

EDIBLE MAGNETISM.

The introduction of scientific or technical ideas and phraseology into popular use, as part of the every-day vocabulary of the people, goes on apace; and the employment of these new terms leads sometimes to strange results. "Magnetism," "electrify," "magnetic," and "electrical," are favorite words at the present time in all sorts of connections, and many of the figures of speech with which orators and divines grace their rhetoric are drawn from electrical science. One of the things we all hear most of and perhaps know least about is "personal magnetism." By and by, when the science has become a little more vulgarized and familiarized, we shall be told of such and such a person that he is a "permanent magnet," or else the defection of his friends and followers will be attributed to the fact that he is only an "electro magnet." But we anticipate. That day of fuller knowledge is certainly far off when Congressman Edward Breitung, of Michigan, can speak of Mr. Blaine's attractiveness in the following extraordinary manner: "Blaine's magnetism is great, but it is of a kind that must be eaten hot. If it gets cold, it sours on the stomach." It may be from insufficient study on our part, but we have to confess that those two sentences give us our first acquaintance with edible magnetism, which we commend to the notice of Prof. Hughes, for investigation.

ANOTHER TELEGRAPHIC DEAL.

Since the failure of the firm of A. W. Dimock & Co. rumor has been busy with the affairs of the Bankers and Merchants' Telegraph Company, the senior of the firm being the mainstay of the company. It is now announced that Mr. Dimock has resigned as President, and that G. S. Mott, the General Manager, has been elected to succeed him. Mr. Dimock remains a Director. He retired from his position as President because of his failure in business. Mr. Mott is to represent capitalists who are to supply means for the work of construction. It has been reported that Mr. Gould wishes to buy up the company, but that gentleman is also reported to say that he does not want them, and would not buy them out. The only advantage that we can see to Mr. Gould, of any weight, in such a purchase, is that he would prevent the system from falling into the hands of the opposition companies, and so "spike the guns." It is also bruited that the Postal Company would like to gain control of the lines, and so far they do not deny the report that they have been negotiating. In fact, we may look for the publication of another telegraphic deal in a few days, transferring the Bankers & Merchants' lines to one of the three other companies. Meantime the Stock Exchang

has it that the next dividend of the Company will undoubtedly be passed. When brighter days come round Mr. Dinock will probably be heard from again.

REWRITING HISTORY IN ART.

Rupert Schmid is the name of a Bavarian sculptor who settled recently in New York, where he has opened a studio and intends to start an art school. He is said to possess much talent, and we therefore take much pleasure in helping to bring him before the community. All we would ask of Mr. Schmid in return for our kindness is that he devote a little time to the study of scientific history. The New York *Herald* says that he is now at work on a quarter-length bust of Thomas A. Edison at the moment when the inventor *made the discovery of the electric light!* This work is said to be broad and picturesque in treatment, showing the scientist holding in his hands a couple of Bunsen cells, whose wires he joins. Mr. Schmid proposes to send the bust to the Philadelphia Electrical Exhibition. We trust that he will take our hint before he carries out his intention of making two more busts, one representing Mr. Edison at the moment when he made the discovery of the electric telegraph and the other at the moment when he invented the lightning conductor.

THE FRANKLIN INSTITUTE AND ITS WORK.

We have already given our readers a map of Philadelphia, showing the relative positions of the various institutes of learning, the hotels and the railway stations to each other and to the Electrical Exhibition. To-day we compile and reproduce an account of the formation, objects and work of the Franklin Institute—the originator of the Exhibition which will, we believe, bring together, in Philadelphia next fall, all that is worth seeing in the electrical world. Our purpose is that the series of Philadelphia letters now begun shall cover all that is interesting in the Quaker City—its men and surroundings—and it will be well for those, both at home and abroad, who purpose visiting the Exhibition, to preserve the forthcoming numbers of THE ELECTRICAL WORLD, to the end that they may study closely what and whom they may expect to see and meet.

TELEPHONIC MATTERS.

As chance would have it, our present issue is more than usually interesting in its telephonic matter. In the patent record no fewer than six new telephonic devices are described and illustrated this week. We give also an illustrated article on a French telephone. Mr. Berliner contributes one of his trenchant letters on the Reis controversy, accompanying a translation from the *Didaskalia*, the journal from which, he hints, Reis borrowed the principle of his telephone.

Incandescent Lighting for Dark Offices.

The nine-story and ten-story buildings now going up in many parts of New York make the streets in which they stand very dark and "stuffy." Nassau street may be taken as an example; a few more lofty edifices there will render it as gloomy as a beer cellar. This cutting off the access of light to buildings through the erection of lofty structures by the owners of adjoining property has given rise to a serious state of affairs in some parts of London, and in populous commercial centres, like New York and other large American cities, not only expense and annoyance, but positive unhealthiness will likely be the result in course of time of making lofty structures shut out sunlight from residences and places of business. In order to obtain with some accuracy the proportion of light lost by a proposed obstruction, the *Building News* says: "The most scientific mode of arriving at the loss is by regarding the luminous sky as seen from the window as a quarter sphere, and dividing it horizontally and vertically by parallels of latitude and longitude, giving to each portion intercepted its relative power of lighting. Of course those portions of the sky surface to the extreme right and left are of less value than those immediately opposite to it. It is assumed rather wrongly that every unit of sky surface emits an equal amount of light. A table of the relative value of light so entering a window vertically placed is founded upon this assumption, and it is easy to find by angular measurements the portions of the sphere cut off or obscured by any addition to a building on the opposite side of the street." The general use of incandescent electric lighting in darkened rooms, and greater attention to the drainage and cleanliness of houses and streets, will do much to promote a good sanitary condition, notwithstanding diminished daylight.

Time by Telephone in Glasgow.

The following details of the manner in which time is supplied by telephone in Glasgow, Scotland, have been made public by Mr. J. T. Bottomley, of the University there. He has had time by telephone, he says, for the last eighteen months:

In Glasgow the town clocks are controlled on Bain's system, or rather a modification of it, by a current transmitted each second from a standard clock in the University Observatory. With a little practice it is easy to hear this current by induction on almost every telephone line and even on the least quiet lines the "tick" of the Observatory clock can be heard after eight P. M., when the post-office telegraphs have ceased for the night. In order to keep the clocks right to the second, there is a "break" at the end of each minute. The impulse corresponding to the last second of the minute is omitted by the Observatory clock; and this "break" is also distinguished, of course, by the telephone. As I always know the time by my watch to less than half a minute, I can thus find the time to a second, and I do so almost every evening.

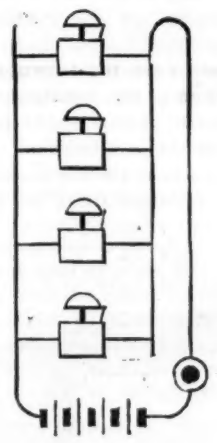
But further, my watch being a particularly good one, I like to have the time to a much more close degree of accuracy than a second; and I have tried many ways, but I have found none so satisfactory as the telephone method. I hang up my watch in front of me and observe the second hand flitting round the dial; and I have ascertained that my watch makes five beats to the second (most watches make either ten in two seconds or else nine). By listening to the "ticks" of the clock through the telephone, and noting the position of the second's hand at the instant of the "ticks," relative to the marks on the dial, I can, without difficulty, make out the time to one-fifth of a second. By this means I have learned some curious things about the going of the best watches at different parts of the twenty-four hours, and under different circumstances.

It is obvious that in towns where time is transmitted from the standard clock to the public clocks it would be easy to supply it also to the telephone subscribers. I have proposed to the local telephone company here to bring the clock current into the Exchange, and let it pass round a coil which would form a "primary." A secondary coil passing round this primary would form in the Exchange a subscriber, called "Clock." Any other subscriber on being connected to "Clock" can obtain the time correct to a second. An operator in the Exchange can supply the minute; or this can readily be done by a striking arrangement. I have already ascertained by experiment that primary and secondary just described give admirable results.

With the Under Dog in the Fight.

To the Editor of The Electrical World:

SIR: As my friend Lockwood says: "I read with interest" in your issue of the 17th inst., four communications



relative to C. G. Tompkins and his bell circuit. Now I am always for the under dog in the fight, and as we used to say at school, "four to one is three too many." So, for Tompkins' benefit, I would suggest that he drop his invasion of No. 282,016, and carry one end of his wire thusly, which I don't think is patented. A circuit of this kind worked well in Chicago as far back as 1879. We think it better than the other, which we abandoned for this at the time. For further suggestions in this line, see "Pope's Modern Practice," page 55. "Combination Locals," edition of 1869, where the same general principle crops out.

C. C. HASKINS.

CHICAGO, ILL.

(The only practical difference between this and the former arrangement, is that this equalizes the differences of potentials at the several bells. This is of practical use only where the main line is of high resistance.—EDS.)

TELEPHONE SERVICE FOR BROOKLYN.—At the meeting of the Brooklyn Aldermen on June 3 Mayor Low's communication about the telephone service of the city government departments, pointing out how $5,150 a year may be saved, was read. Alderman Connor thereupon moved that the Mayor be authorized to make an agreement with the New York & New Jersey Telephone Co. by which that company shall be granted the right to use, during the pleasure of the Common Council, for their telephone wires, so much of the poles of the Fire Department as shall not be needed for city purposes, upon condition that the company shall, so long as it uses the poles, at its own expense keep them in proper repair and condition; shall keep all city wires thereon in good order, and furnish the city free of cost 100 telephonic instruments, such as are leased to the city at $20 apiece per annum, and, in addition, connections with the telephonic exchange to the number of 35; and in case the city shall require any additional exchange connections shall furnish the same at the rate of $60 per annum for each connection and furnish all materials necessary to be used for or with the instruments at cost. The motion was referred to the Committee on Public Lands and Buildings.

REVIEWS OF NEW BOOKS.

A HISTORY OF ELECTRIC TELEGRAPHY TO THE YEAR 1837, by J. J. Fahie, Member of the Society of Electrical Engineers, etc. London and New York: E. & F. N. Spon, 1884, p. p. 542. Price, $3.

This is a great deal on the plan of a "History of the United States to the year 1776," before the States existed. But such a history of the country is interesting though its title may be a misnomer.

Electric telegraphy did not exist as an art in 1837 hence its history dates its beginning since that time. But the desire to use electricity as a means of communication existed long before, and many persons indulged in speculative ideas, experiment, theory and practical efforts to accomplish the *desideratum*.

The United States were not formed by the battle of Bunker Hill nor by the surrender of Yorktown. Neither did the experiments and speculations of Franklin, Volta, Faraday, Ampère and Edward Davy make an electric or magnetic telegraph. The battles laid the foundation for the Union, and the works of these men founded the telegraph.

To the student of history a well written statement of happenings in early times has an interest, though the statement may partake of the romantic. To the lover of romance, histories of times of rise or fall are sure to be of interest.

This book is no exception to this rule. It is interesting to all who like historical reading especially when it relates to an art in which the reader is engaged. Electricians and telegraphers should have it.

We hope that the author will write something of the history of the telegraph since 1837 and that he will find a publisher who will do as well for him and the purchaser as the Messrs. Spon have. The cuts, type, press work, binding, etc., are all excellent.

Philadelphia and the Exhibition.

I.

The Franklin Institute.

In recording the progress of the forthcoming Electrical Exhibition at Philadelphia it is just and proper that we should first make honorable mention of the Franklin Institute and its officers, under whose auspices the Exhibition has been arranged. The exhibitions which have frequently been given by the Franklin Institute have been productive of much good—they have invariably attracted large crowds of people, who hitherto had had no conception of the extent and variety of our home productions, and they have reacted in many ways to bring producers and consumers together; but nothing has ever been attempted on so large a scale as the Electrical Exhibition now being fitted up in Philadelphia.

The hall of the Franklin Institute is a large and substantial structure of blue stone, situated on the east side of Seventh street, midway between Market and Chestnut streets. The corner stone of this building was laid in the year 1825, and it has been occupied by the Institute to the present time. Upon the first floor are located the lecture room and the chemical and physical laboratories. The second floor is entirely occupied by the library. This is exclusively scientific and technical in its character and is rapidly increasing. It embraces, in addition to all the standard and current works upon engineering, mechanics, physics, chemistry, metallurgy, etc., complete files of the publications of the principal learned societies of the world, and of the leading scientific and technical serials, besides complete sets of the British, American and French patent reports. The extent and the very complete condition of these publications make the library of the Franklin Institute perhaps the most valuable library of reference upon scientific and mechanical subjects in the United States. For this purpose it is accessible to the public, and visitors from all parts of the country constantly consult its shelves.

The upper floor is entirely devoted to the use of the large drawing classes, composed of young men and women pursuing studies in mechanical, architectural and free-hand drawing. The drawing school has been carried on uninterruptedly since the establishment of the Institute, and at present is in a most flourishing condition, both as to the efficiency of its means of instruction and the number of its pupils.

The kindness of Dr. Wahl, the Secretary, and Mr. Holman, the Actuary of the Institute, enables us to give the following interesting sketch of its history and work:

The Franklin Institute was founded in 1824. In that year some earnest mechanics of Philadelphia met together to found an institution for the promotion of mechanic arts, at that time in their infancy in this country. From the period of its establishment to the present it has actively and honorably fulfilled its mission, and has been so closely identified with many measures for the encouragement and stimulus of the arts and manufactures that no history of American industries would be complete which omitted to record its services.

During the sixty years of its existence it has had the rare good fortune to have been under the leadership and guidance of men distinguished alike for their scientific or mechanical attainments and eminent personal worth, who have jealously guarded its reputation and expanded its powers for usefulness. From the first it has been essen-

tially democratic in character. The learned professor and the artisan have been made equally welcome, and have equally enjoyed its benefits, and from this happy union of science and practice much of the usefulness of the Institute has been derived. On this subject we cannot do better than quote the words of Mr. Coleman Sellers, a former President of the Institute:

"Our Franklin Institute was from the beginning a Mechanics' Institute, in one sense of the word. It taught by lectures, and sometimes by classes, but it was always more than was contemplated by the societies abroad. If I may so express myself, it was, and still is, a democratic learned society; it is not exclusive. No well-behaved person is excluded from its membership. All who desire to reap its benefits, or to aid it in its great work of promoting the mechanic arts, can join it. This is not so with the so-called learned societies of this and other lands. They select their members from among those who have already distinguished themselves in the arts or sciences, or are likely so to distinguish themselves; hence their membership is confined solely to the learned of the land. Now, mark the difference in our case. Learned men join our society, and in its hall come in contact with those who may be unlearned, so far as books are concerned, but better informed in some special art or trade. Theory and practice are brought together, and each helps the other. Distinguished scientists admit that they are indebted to this association for information of a practical character, probably not readily obtainable otherwise. While, on the other hand, we, each one of us, know how we have been benefited by their learning, and with what attentive earnestness we listen to their words."

The Franklin Institute signalized the earnestness of purpose of its founders in the promotion of the mechanic arts, by holding in the year of its foundation the first exhibition of American manufactures ever held in this country. This historical event occurred in the year 1824, in the old Carpenters' Hall in Philadelphia, and was crowned with complete success. From a circular letter issued by the Corresponding Secretary, and dated December 5th, 1824, we extract the following as an intresteing account of an exhibition in the times of our grandfathers: "The exhibition commenced on the second day of October and continued for three days, during which time the rooms were visited by thousands of our fellow citizens and strangers, all of whom went away apparently highly gratified, this being the first exhibition of the kind that had ever taken place in this city. The managers labored under many disadvantages, yet some of the persons best qualified to judge, because the most intimately acquainted with the rise, progress and present state of our manufactures, expressed their astonishment not only at the number and variety of the articles produced but the superiority of their quality. Every well-wisher of the country was delighted with the opportunity the Franklin Institute had afforded of demonstrating that the United States can fairly compete with foreigners in most of the useful articles of manufacture."

These exhibitions, which in our days have come to be so popular, have been continued by the Institute at short intervals down to the present until all its brilliant achievements in this direction are about to be eclipsed by the International Electrical Exhibition.

The Institute commenced in the year 1826 the publication of a *Journal* devoted to science and the mechanical arts, which has had an uninterrupted existence to the present day, It contains the record of the scientific work of the Institute, besides many valuable contributions respecting the growth of American industries and the progress of science and the useful arts during the past half century. It is highly esteemed at home and abroad as a standard work of reference.

The rapid growth of the library and schools of the Institute of late years has taxed the ingenuity of its officers to the utmost to carry on its work effectively, the accumulation of books, models, instruments, etc., having become so great as to make it almost imperative to secure more ample quarters. In the collections of the Institute are some interesting historical relics, among which may be named the original electrical machine of Dr. Franklin, Godfrey's original quadrant, the original telegraphic apparatus of Morse, models of Oliver Evans' high-pressure engine, and others of less importance. The great collection of works on electrical subjects now being made will render the library of the Franklin Institute one of the most valuable and interesting in the world to electricians.

The giving of annual courses of lectures on subjects relating to science and the mechanical arts has been an important part of the work of the Institute since its foundation. These lectures are continued at the present time and constitute one of the most attractive and valuable of the privileges of membership. At the monthly meetings which are held during ten months of the year, papers on important scientific and mechanical subjects are read and frequently afford material for instructive discussion at these meetings likewise new inventions are exhibited; and described, and a report upon current progress in science and the arts is presented by the Secretary. The meetings are largely attended and are frequently of a highly interesting character.

Of the many important services to the cause of science and the arts which the Franklin Institute has rendered during the sixty years of its useful and honorable career a few only need be named in addition to what has already been mentioned to give the reader of this brief history an idea of their nature. Early in its history, in connection with the American Philosophical Society, and with the encouragement of the State Legislature, it organized and conducted for many years a system of meteorological observations, with the aid of observers in all parts of the United States, who engaged to report faithfully to the committee at regular intervals all their meteorological observations and in particular the details of storms.

It was the day of stage coaches and high postage, hardly ever pre-paid, but with all these disadvantages the committee was furnished by its correspondents with the particulars of fourteen great storms, and from the observed data was enabled to evolve a practical theory of storms which is essentially the same as that now accepted as correct.

The results obtained were tabulated, and for a number of years were published in the *Journal*. This work may

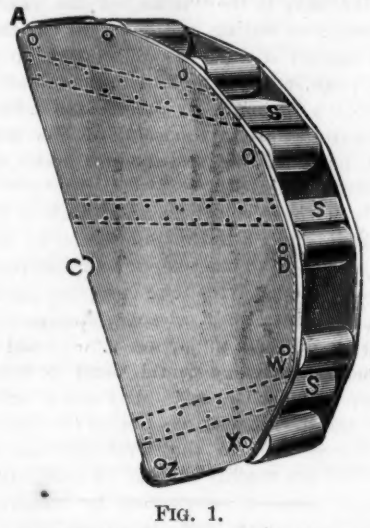


FIG. 1.

be regarded as the first step toward the more elaborate system which to-day, with the aid of the telegraph, finds its expression in the Signal Service of this and other countries, and which has been of such incalculable benefit to commerce and agriculture. At the request of the State Legislature the Institute examined and reported upon our system of weights and measures, and upon this report the law was enacted which is now in force in the Commonwealth. At the request of the Treasury Department of the United States, the Institute, about the year 1836, undertook the investigation of the important subject of the causes of the "Explosion of Steam Boilers." This research, which was a thorough and exhaustive one, attracted much notice and contributed greatly to establish the scientific reputation of the Institute abroad. It forms to-day an important contribution to the bibliography of this subject. Of great value also was the report of a committee of the Institute on "Water Power." Of special importance also was the work of the Institute in connec-

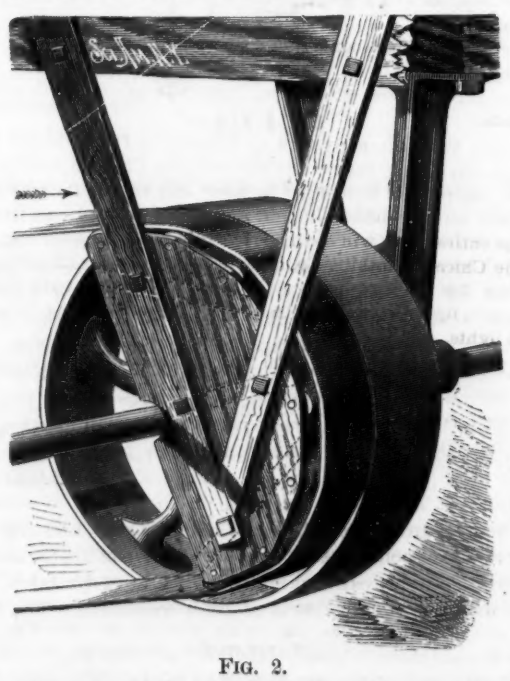


FIG. 2.

tion with the introduction of the uniform system for the sizes of "Screw Threads"—now universally adopted throughout the country, under the name of the "Franklin Institute Standard."

Of its more recent contributions may be named its report on the "Transmission of Power by Belts;" on the determination of the "Horse-Power of Steam Boilers;" on the "Efficiency of Dynamo-Electric Machines," and on the "Conditions of Safety in Electric Lighting."

Less prominent, though none the less useful, has been the work of the "Committee on Science and the Arts" of the Institute which, during the period of some fifty years, has examined and reported upon the merits of a multitude of inventions—and to whose wise counsel and efficient aid many worthy persons are indebted for the successful introduction of their inventions, or have been dissuaded from wasting time and money upon impracticable schemes.

Associated with its past history are the well-known names of Merrick, Ronaldson, Keating, Baldwin, Bache, Agnew, Espy, Harrison, Johnson, Mitchell, Patterson, Frazer, Cresson, and many others of equal eminence; while its roll of membership to-day embraces the names of all who are identified with the learning and industries that have given Philadelphia her leading position among American cities. The Institute and its members are pledged to the sciences and the arts, and their devotion, enthusiasm and effective work are regarded with pride, not by Philadelphians or Americans alone, but by every good and true "Citizen of the World."

The progress made upon the Exhibition buildings in West Philadelphia gives ample assurance that they will be finished within the time, June 15th, but there will then remain much to be done to have them in readiness for the reception of exhibits. The roofs are all on the structures and the weather boarding has been put on the exterior half or two-thirds the way up from the ground. Above this will be sash and glass for the admission of light. The main building, which consists of a series of spans, is provided with skylights and other openings. All the roofs are being covered with felting, and a white wash has been put on the interior, while on the outside a light yellowish wash is being put on. Prior to the erection of the structures, drains were constructed, and within the past few days water has been introduced. It is the design of the managers to have the exhibition lighted by electricity, and it is believed that arrangements will be made by which the competing electric light companies will alternately light up the buildings. Large as the plot of ground is, it has already proven inadequate for the purpose, and the Franklin Institute has succeeded in obtaining possession of the old Pennsylvania Railroad Depot with the shedding on Thirty-second street. The depot will be made use of for the historical display of the exhibition and in which to hold lectures, while the shedding will be set apart for the motors, railroad switches with signals, etc. J. C.

PHILADELPHIA, June 2, 1884.

The Wellington Belt Holder.

The adjoining illustrations show a novel device intended for substitute for loose or dead pulleys. The first cost of it is less than that of the former and much less than that of the latter. By its use the constant running of the belt, and the wear, heating and frequent rattling of loose pulleys and the constant strain on the shaft when the machine is not wanted to run, are all avoided.

It consists of a series of rollers turning on iron axle bolts which are supported at both ends in a strong frame arranged in a curve corresponding with the rim of the driving pulley on the line shaft beside which it is placed. Fig. 1 shows its usual form. It is also made semi-circular. The rollers from *A* to *X* are placed level with the pulley rim. The roller *Z* is usually placed inside the pulley circle, thus giving a little slack to the belt. Fig. 2 shows the holder supported beside the driving pulley on the line shaft. The belt is easily thrown from the driving pulley to the holder and from it back to the pulley at will. It can be put in position at any time without disturbing the pulley or the shaft, since it is all on one side of the shaft and touches neither it nor the pulley.

Several hundred are in use, all the way from 12 inch diameter and 2 inch face to 94 inch diameter and 14 inch face, by many of the most prominent manufacturers in the country. It is especially adapted for use with dynamo machines. It is so light the expense of transportation is very small. It is manufactured by W. R. Santley & Co., Wellington, Ohio, who will be pleased to furnish further particulars upon application.

Two Annual Telegraph Reports.

The annual election of the Central & South American Tel. Co., was held on the 3d inst, and the following were chosen directors for 1884: Ed. D. Adams, M. P. Grace, Wm. G. Hamilton, Charles Lanier, J. Pierpont Morgan, Alfred Pell, Theo. Disabla, James A. Scrymser, R. W. Thompson. The earnings of the company, amounting to $265,382, have been used to pay its construction account. It is estimated that by August 1 the company will have paid off $301,000 of debt with its net earnings, leaving 9,934 shares of stock in its treasury and no debt. From January 1 to June 1 the earnings were $149,556, an increase of $83,386. The operating expenses were $48,000.

At the annual election of the Mexican Telegraph Company, held in this city, also on the 3d, the following gentlemen were elected directors for the ensuing year: John A. Alexander, George Blagden, Robert B. Minturn, Alfred Pell, James K. Gracie, William G. Hamilton, J. Pierpont Morgan, James A. Scrymser, James J. Higginson.

The net revenue to December 31, 1883, was $132,850.10, from which there should be deducted for dividends and Mexican Government participation $60,702.30, leaving a surplus December 31, 1883, of $72,157,80.

The earnings from January 1 to June 31, 1884. (June being estimated), were $118,456; operating expenses, $30,000; estimated surplus, July 1, $160,613.80; providing for a dividend, payable in August, of $57,376, the balance, $103,237.80 being carried to reserve. The company has no debt.

A BAD FIRE.—It is announced by cable that the workshops of the Swan Electric Light Company, at Lille, in the north of France, have been destroyed by fire. Four persons were injured by the falling of a floor.

DEPARTMENT OF INQUIRIES.

While we are pleased to answer in this department all questions of general interest to our readers, and do so without charge for time or expense, we must request those of our patrons who desire information for their personal interest, and who cannot be properly answered in this way to send us with their request a small sum, say from $1 to $5, to pay for the time and the expense incurred for their exclusive benefit.

69.—ELECTRIC LAMP CIRCUIT.

"What is the resistance of circuit when six lamps of electric light are cut out; and how do we make up for it?" O. W. S.
READING, Pa.

The resistance depends upon the number of lamps originally in circuit. Of course it is less by the proportion which six bear to the whole number. On a general average it may be well to assume (if guessed at at all) that each arc lamp when burning offers 4½ ohms resistance. But the resistances of the different lamps of the different systems vary above and below this assumed average. Six lamps then offer 26 ohms resistance, and the ways of compensation are either to substitute a like artificial resistance or to lower the electromotive force of the dynamo. The first is uneconomical because it takes just as much power to run the reduced number of lights as before the reduction. The second is economical because the power required is in proportion to the number of lights run. The substituted resistance in the first case may be a length of wire having the required resistance and exposed to free access of currents of air to keep it cool.

70.—ELECTRIC LAMPS.

"Has there any mechanical device been made to take the place of the fluid dash-pot in electrical apparatus?" C. S.
BRIDGEPORT, Ct.

We believe not fully. Air dash-pots are old, but do not act as equivalents of those filled with a liquid. They are springy from the elasticity of the air. Liquids, not being elastic, that is to say, not compressible, must flow from one side to the other of the piston more or less slowly if the piston moves at all. Air flows in a similar manner, but, being compressible, the piston may move rapidly to and fro, as against and from an elastic body like a spring. A rotary fan, on a quick-moving shaft actuated by clock-work, has been used. But that is open to the objection urged against the air dash-pot. Escapement and pendulum attachments to clock-work answer quite well in some cases. A wheel having mercury in its hollow rim is a fair device and has been found to work well in some electric lamps and motors.

THE TELEGRAPH.

THE BALTIMORE & OHIO COMPANY have begun to cut rates between New York, St. Louis and Chicago.

ROBBING PETER TO PAY PAUL.—We seem to approach the time when the every-day man who wants to send a cable message won't have to economize in his church contributions for six months to do it.

THE COMMERCIAL CABLE.—Mr. Mackay telegraphs his people that the new commercial cable will be ready for business in twenty days, at a shilling a word for all kinds of telegrams, and the Postal Telegraph people say they have enough money on hand to round out their whole system.

A NEW CABLE ENTERPRISE.—The concession granting the right to lay a cable between Portugal and America, which was obtained some time ago, has been transferred to a joint stock enterprise entitled the American and British Continental Cable Company. The first section of the cable to St. Michaels, one of the Azore Islands, will be laid in September.

FRANKLIN TELEGRAPH CO.—At the annual meeting of the stockholders of the Franklin Telegraph Company held at Boston on June 4 the following Directors were chosen for the ensuing year: Charles A. Tinker, Norvin Green, T. T. Eckert, John Van Horne, A. R. Brewer, Jay Gould, Frederick L. Ames, Joseph F. Greenough, and Thomas Roche. R. H. Rochester was elected Treasurer, and Thomas Roche, clerk.

NO "TICK" FOR TICKERS.—Straws that show how the winds blow on the Wall street heath, says the *Dial* of June 2, were seen in the Gold and Stock Telegraph Company's office this morning. It was evidently Blue Monday, and the collectors were started out with their characteristic purple bill heads as soon as the first man showed his head down town, presented their bill for June and told him they wanted a check by noon. "What—are Gould's loans expiring to-day?" inquired the man, "that you are in such a hurry for your check by noon in advance for the month, or is Gould afraid of another panic and collecting in his rentals?" This seems like a forced call loan or running the tickers "on tick."

THE UTICA DISTRICT TELEGRAPH CO.—A certificate of incorporation has been filed in the New York County Clerk's office of a company for the purpose of constructing and operating lines of telegraph within the State of New York, the name to be "The Utica District Telegraph Company." The general route is to be from New York City to Utica, and the capital stock is placed at $50,000 in 5,000 shares of the value of $10 each. The privilege is reserved to increase the capital to $100,000. The shareholders mentioned in the certificate are C. D. Haines, of Brooklyn, 2,000 shares; E. T. Haines, of Brooklyn, 2,000; S. H. Sterns, of New York City, 1,000 shares. The period for which the incorporation is drawn is from May 26, 1884, to May 26, 1983. The central office is to be in New York City.

THE TELEPHONE.

THE ROCKY MOUNTAIN CO.—The regular annual meeting of this company will be held on the 9th inst., at Ogden, Utah. A good report is expected, as the business has been growing rapidly.

THE TELEPHONE IN GERMANY.—Merchants in Mannheim are crying out against the high rates for telephone subscriptions. They do not regard government control in the light of a blessing.

THE TORONTO FIRE.—Last week we gave an account of the fire in the Toronto *Mail* building, in which the Telephone Exchange was located. We now learn that the service was restored with the most commendable rapidity, and is in operation as before.

TO REMOVE POLES.—At a meeting of the Park Commissioners of this city, on June 4, a resolution was adopted ordering the Metropolitan Telephone Company to remove the poles recently erected in Park avenue, between Sixty-seventh and Ninety-sixth streets.

FOR THE LORD OF THE SCILLY ISLES.—Mr. Smith-Dorrien, Lord of the Scilly Isles, has connected his house on one island with the house of his steward on another island about three miles off. The line, running under the sea, appears to work quite satisfactorily.

THE GILLETT TELEPHONE AT WORK.—The Cleveland *Leader* of June 1 reports a very successful test of the Gillett telephone between Cleveland and New York, by Mr. Alfred Beale, over the Postal wire. The distance is about six hundred miles. The reporter who heard the test gives the conversation between the two cities at length.

A CURIOUS EXPERIMENT.—It is known, says the London *Electrician*, that if there be a primary circuit comprising a microphone, a Leclanché battery of, say, three cells and the primary wire of an induction coil, and a secondary circuit comprising the secondary wire of such coil, another Leclanché battery of, say, 12 cells, and two metal contact pieces, such as are used for medical purposes, and if two persons each hold a contact piece in one hand, and one of them lays his disengaged and gloved hand on the ear of the other, the latter will hear words that are spoken into the microphone, as if they came out of the other's hand. At a recent meeting of the French Physical Society, M. Hospitalier modified the above experiment by replacing the gloved hand by a piece of ordinary paper. Two persons took hold of the contact pieces as before, and placed their heads together ear to ear, with the paper between, and could hear all that was said at the microphone. Further, holding the contact pieces as before, these two laid their disengaged hands on the ears of a third person, who again heard what was spoken into the microphone, the hands appearing to talk.

THE ELECTRIC LIGHT.

A CANADIAN HOTEL.—The Windsor Hotel Company has under consideration, says the Montreal *Witness*, a proposition for the supply of a special incandescent electric light, using an engine to be erected on the premises. This, it is thought, will be a more economical method of supply than its conveyance from distant stations with the certainty of leakage and the cost of conductors and wires.

THE AMERICAN ELEC. & ILL. CO.—The newly elected board of directors of the American Electric and Illuminating Company organized on May 29 as follows: President and General Manager, Edward H. Goff; First Vice-President, Silas Gurney; Second Vice-President, Loren N. Downs; General Superintendent of Construction, C. D. Smith; Executive Committee, Messrs. Goff, Gurney and Downs. F. Montague Sowden was elected Treasurer and Clerk of the Corporation at the annual meeting.

MOVING TO NEW QUARTERS.—The Excelsior Company have moved their office from 66 Duane street to very convenient and comfortable offices at 13 Dey street, on the second floor. There the pleasant and shrewd Manager, Mr. George D. Allen, can always be seen. Mr. Wm. Hochhausen, the Superintendent and Electrician of the company, is to be found at the fine new factory, Willoughby street, between Raymond and Navy streets, Brooklyn, where everything that pertains to their system is made.

THE EXCELSIOR SYSTEM IN CHICAGO.—Davis, Morse & Co., who will occupy the new Leiter building, Chicago, have awarded the contract for lighting it to Mr. F. W. Horne for 40 Excelsior lights, and incandescent lights from the same circuit for offices. The entire plant will be run by an 80 horse-power Ide engine. The Chicago Clothing Co. have also given to Mr. Horne the contract for 10 arc lights of 3,000 candle-power each—to be the largest lights in the city; a 15-light dynamo being wound for 10 lights.

THE SPERRY SYSTEM.—On May 26 the Sperry Electric-Light Motor & Car Brake Co., says the Chicago *Industrial World*, successfully ran arc and incandescent lights upon the same circuit wire, all being supplied from the same dynamo, and this success has led to their determination hereafter to supply but one dynamo and run but one circuit, thus enabling them to supply churches, hotels, public grounds and places of amusement with both arc and incandescent lights from the same machine. They have shipped 50 arc lights to Omaha, Neb.

THE FORT WAYNE JENNEY CO.—The progress made by this company during the past year has been very rapid and far-reaching. They have put in several plants recently, besides increasing those of longer standing. A large plant at Danville, Ill., has just been completed, starting the first night with 80 private lights and 30 city lights for street lighting, the latter being placed on six towers of five lights each. The towers were furnished by the Star Iron Tower Company. Danville is well pleased with her new means of illumination. The company are now constructing a plant at Goshen, Ind., where they will use the Star towers for city lighting.

THE AMERICAN ELEC. & ILL. CO.—We published last week a condensed report of the annual statement of the above energetic and prosperous company. Among other important matters referred to in the full report are the questions of steam power and of incandescent lighting. With regard to the former, it is stated that the directors have under consideration a good device that will reduce at least one-half the cost of producing steam. With regard to the latter, it is stated that Prof. Thomson has perfected his system of incandescent lighting for the Company, and that the lamps will be made and used at once. The Company are also nearly ready to begin the use of electric motors in connection with the new Boston station, for the transmission of power for manufacturing purposes.

A FINE SUBMARINE LAMP.—A steamer built recently on the Clyde for the fisheries at Batavia, has been fitted with machinery to supply current for a 15,000 candle-power lamp, which it is intended to lower into the sea for a depth of ten fathoms or less, as the exigencies of the drift net fishing require. The current is supplied by one of Paterson & Cooper's No. 4 dynamo machines, coupled directly to a Gwynne high speed vertical engine, and running at 650 revolutions a minute. The lamp, which is inclosed in a flint glass cylinder 9½ inches diameter, is suspended from a davit over the vessel's side, and the two conductors consist of finely stranded copper cord inclosed in india-rubber hose. These conductors pass over pulleys on the end of the davit, and the lamp is raised or lowered by a winch fitted to the bottom of the davit. The trial of the apparatus lasted for four hours, during which time the lamp was submerged and kept alight with the full current of 60 ampères through it.

THE LONDON HEALTH EXHIBITION.—The electric light is conspicuous at this new London show. On the opening night the Hammond Company had the whole length of the western corridor lighted with bright arc lights, and also illuminated the west quadrant in like manner. The entrance vestibule and the dining rooms were beautifully lighted by incandescents by the Edison-Swan United Company, and the great south gallery by Siemens with a thousand Swan incandescents as before. The former fish market, now a dining room on the Duval system, was lighted by many arc lights, and presented a very cool and pleasant appearance. The Central Gallery was again lighted by the Jablochkoff Company, the lights having a far better aspect than formerly, being now shaded by the Trotter prismatic lamp-glasses. The windows of the corridors are arched externally with little yellow lights, which form jewel-like settings to the bluish glare seen through the windows from the electric arcs within.

MISCELLANEOUS NOTES.

CHICAGO UNDERGROUND WIRES.—The city electrician, thoroughly convinced of the efficacy of underground telegraphy, is now superintending the placing of all the city wires under ground.

ELECTRO-MAGNETIC BRAKES.—The American Electro-Magnetic Brake Company, of St. Clair County, Illinois, has been licensed to organize by the Secretary of the State, with a capital stock of $100,000. The incorporators are Richard Hospes, Edward Mallinckrodt and Eugene F. Weigel.

ELECTRIC DYEING.—M. Goppelsroeder reports to the Mulhouse (Alsace) Society, that by causing a current of electricity to pass through a caustic potash solution containing indigo held in suspension in a copper vessel, the same inclosing a porous cylinder containing a solution of a similar kind, he so reduced the indigo that he could dye cotton with it.

WHAT WATER WAS MADE FOR.—According to the *Tribune*, James Crutchett, of this city, has written a pamphlet on the advantages of steam carbon gas, in which he propounds the conundrum, "Do you know that the Divine has revealed to man that water was made for fuel, light and power?" And then he squares himself by adding in parenthesis, "if properly mixed with a small amount of carbon."

THE ATWATER ELECTRIC MOTOR.—A statement comes from Chicago that the Atwater electric car and motor has been exhibited there, running on a track with a 24-cell battery of zinc and carbon elements. The claim made for this motor is that it requires only a tenth of the electric current heretofore used by electric motors, on account of increased leverage over load. It would be interesting to know a little more about this motor.

A MARVELOUS THERMO-ELECTRIC GENERATOR.—News comes from Indianapolis that Mr. L. G. Woolley, one of the inventors of the electric headlight for locomotives, has invented a wonderful thermo-electric generator. One of the newspapers actually has the effrontery or gullibility to state that with an ordinary coal-oil lamp burning beneath a "copper boiler" of two gallons capacity, that contains certain metals, a supply of electricity has been obtained which ran a one-horse engine and fed four incandescent lamps, the oil for eight days and nights costing only 20 cents. The same apparatus has also, it is alleged, been supplying a current of electricity that suffices to operate 600 miles of telegraph wires.

STOCK QUOTATIONS.

Telegraph, telephone and electric light stocks were quoted as follows on Wednesday at the Electric, Manufacturing and Miscellaneous Stock Exchange, and at the Stock Exchange:

TELEGRAPH.—Am. Cable, b 51, a 53; American Rapid, b 50, a 65; B. & M. Co., b 40, a 45; Commercial Telegram Company Pref'd, a 109; Commercial Telegram Common, a 95; Harlem District Telegraph Co., b 2, a 2.50; Manhattan Telegraph, b 10, a 85; Mexican, b 125, a 147; Postal Telegraph (stock), b 4.25, a 4.75; Postal Telegraph Bonds, 1st, 6 per cent. b 44, a 48; W. U., b 61⅝, a 61⅝.

The stock market has been in a somewhat feverish condition with prices generally higher. Various reports have been current with regard to new telegraphic combinations.

Commission houses report a large increase in orders to buy Western Union, mainly from the West, but a good many orders to purchase came from the capitalists in this city, who brought the bank notes to pay for them.

Negotiations are progressing, it is said, which, if successfully carried out, will result in a great advance in Western Union shares. As the negotiations are with foreign capitalists the matter will necessarily take a little time. Does this mean a renewal of efforts made by Dr. Green and Gould the younger?

TELEPHONE.—American Bell, a 160; American Speaking, b 110, a 125; Currier Telephone Bell, b 3; Colombia and Panama, b 24.50, a 24.75; Continental, b 15; Dolbear, b 5, a 10; Globe b 4, a 6; Hudson River, b 60, a 91; Inter-Continental, b .95, a 1.25; Mexican Central, a 3; Missouri & Kansas, a 10; Molecular, a 9; New England, a 90; New York, a 85; New York and New Jersey, a 70; New York and Pennsylvania, b 50, a 85; New York State Overland, b 15, a 20; Overland, b 10, a 12; People's, a 11; People's (N. E.), b 1, a 10; Southern Bell, b 95, a 125; Southern New England, a 175; Tropical, b 2, a 2.50.

The Boston *Advertiser* of June 4 says: In telephone stocks, Bell Telephone advanced 2 to 158.

ELECTRIC LIGHT.—American, b 2, a 4; Baxter, b 23, a 25; Brush, b 50, a 80; Brush Illuminating, b 45, a 70; Daft, a 90; Edison, b 50, a 100; Edison Illuminating, b 55, a 75; Edison Isolated, a 90; Edison European, b 8, a 15; Excelsior, b 20; Swan Incandescent, b 15, a 40; United States, b 75, a 95; United States Ill. Co., a 90.

In the assignee's list of the assets of Mr. Fish, President of the Marine Bank, lately suspended, are 10 shares of the Edison Electric Lighting Co. of Europe, nominal value $1,000, actual value $100; also 500 shares Spanish-American Light and Power Co., nominal $50,000, actual $35,000; 120 shares same, nominal $12,000, actual $8,400, pledged for loan; interest in 255 same, nominal $25,500, actual $17,850, pledged for loan; 19 shares United States Electric Lighting Co., nominal $1,900, actual $1,900; and 10 shares Solenoid Telephone Co., nominal $500, actual $500.

Kohlsaat & Co., No. 30 Pine street, furnish the following quotations for miscellaneous securities:

	About.		About.
Am. Bell Telphone	159	Eastern Telephone	26
Mexican Telephone	20	New England Telephone	25
N. J. & N. Y. Telephone	55	N. Y. & Pa. Telephone	56

On Wednesday A. H. Muller & Son sold at auction 200 shares American District Telegraph Co., hypothecated, $100 each, at 7, and 450 shares Bankers & Merchants' Telegraph Co., hypothecated, $100 each, at 41⅛ and 44.

BUSINESS NOTICES.

PRIDE, FRALEIGH & KYLE, electrical and telegraph engineers and contractors, formerly at 23 Dey street, are completing at 18 Dey street an extensive office for test and experimental purposes.

AN ELECTRIC LOCOMOTIVE FOR SALE.—Any one who wants to make a little money at seaside or other popular resorts this summer could not do much better than buy "The Judge," offered for sale to-day in our advertising columns, and an illustration of which appears also in our series of articles on electric railways. The novelty would be an immense attraction. "The Judge" was a brilliant success at Chicago and Louisville.

THE WESTINGHOUSE ENGINE.—We publish to-day a statement showing the sales of Westinghouse engines for February, March and April. The total for the three months is 151 engines, of 5,031 horse-power. We notice, as indicative of activity in the electric lighting business, that no fewer than 25 of the largest were bought for electric light purposes. The whole list is a remarkable proof of the deserved popularity of this engine.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

Edited by N. S. KEITH, Electrical Engineer and Expert, 9 Murray Street, New York.

PATENTS DATED MAY 20, 1884.

Apparatus for Charging Secondary Batteries; Robert Percy Sellon, of Surbiton, County of Surrey, England..... 299,021

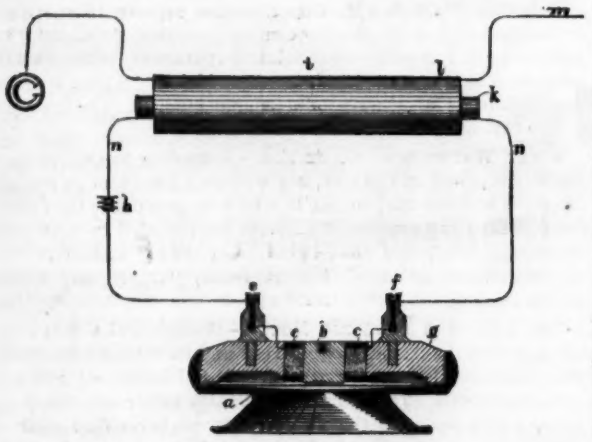
Devices for throwing the battery in or out of circuit with the dynamo whenever necessary to stop or start supply of electric current.

Armature for Electric Motors and Dynamo-Electric Machines; Joseph C. Vetter and Stephen G. Putnam, of New York, N. Y. 298,922

Consists in a rotary armature having a core which is doubled or returned upon itself, or in other words a core which extends from side to side of the armature in its course around its circumference.

Receiving-Telephone; Charles E. Scribner, of Chicago, Ill., Assignor by mesne assignments, to the American Bell Telephone Co., of Boston, Mass..... 298,783

The diaphragm is at *a* and *b* is the soft-iron core surrounded by the coil *c*. Binding-posts *e f* are provided in the bed-piece *g*, which may be of wood or other suitable material. *i* is an induction-coil consisting of two windings. Winding *k* should be of low resistance, preferably of about one-half an ohm, while the other winding *l*, should be of comparatively high resistance,



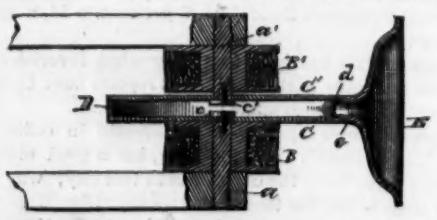
preferably of about one hundred and fifty ohms. Winding *l* forms a part of the circuit of the main line *m*, and winding *k* forms a part of the circuit of the line *n* of the battery. No permanent magnet is necessary. The battery-current through the coil *c* charges the soft-iron core *b*, and also the soft-iron core of the induction-coil. The cores are thus made sensitive to the voice-current vibrations. These currents passing through the high-resistance winding *l* are reproduced by induction in the low-resistance winding *k*, and the induced vibrations find circuit through the coil *c* of the telephone. The magnetic tension of core *b* is thus varied and the sound-vibrations reproduced at the diaphragm *d*.

Covering for Electrical Conductors; Frank S. Harrington, of Providence, R. I., Assignor to himself and Herbert N. Fenner, of same place..... 298,751

Consists in taking a thin strip of copper or brass, corrugating it longitudinally, and after passing it through a soldering fluid, passing it through a bath of melted tin or solder to coat it thoroughly. It is then wound on a conductor that has previously been covered with some insulating material.

Telephone Receiver; Henry E. Waite, of New York, N. Y., assignor to Charles F. Livermore, Trustee, of same place..... 298,924

A represents a magnet of U shape with its ends turned inward toward each other, or provided with inwardly-extending arms *a* and *a'*, forming its poles, arranged in the same transverse line, with their ends facing each other, as shown. Upon these arms, which form cores therefor, are placed the spools or coils *B* and *B'*, and upon or to their extreme inner or adjacent ends are secured diaphragms or discs *C* and *C'*, one, *C*, being clamped against the end of the arm *a* by a headed screw, *c*, and the



other, *C'*, having its central perforation enlarged to receive the end of arm *a'*, upon which it is held by a headed screw, *c'*, the arrangement being such that one of the discs is clamped firmly to its arm, while the other is free to turn or be adjusted upon its arm. The two diaphragms *C* and *C'* are connected at their peripheries by a covering, *D*, of thin wood or other suitable material, in such manner as to form, with their covering, a shallow cylindrical resonating-box or drum, in which the poles of the magnet terminate, as shown. The shell or connecting cover is perforated at one point, *d*, to receive the central terminal tube, *e*, of the ear-piece *E*, which may be of any usual or preferred form.

Dynamo-Electric Machine; Thomas A. Edison, of Menlo Park, N. J..... 298,954

Uses a divided commutator brush, consisting of alternate layers of metal and insulating material.

Dynamo-Electric Machine; Thomas A. Edison, of Menlo Park, N. J..... 298,955

The commutator segments are in greater number than the bobbins on the armature. A common-multiple number of these segments are connected to each bobbin.

Electric Arc Lamp; Sidney Howe Short, of Denver, Col..... 299,025

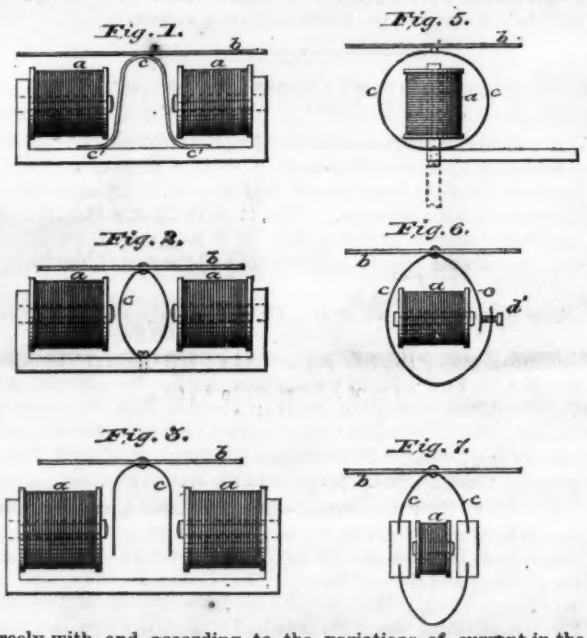
Consists in inclosing the electrodes in a globe, air tight at the bottom and opening at the top into a chamber or box which contains the lamp mechanism.

Electric Battery; Orson Millard, of Flint, Mich., Assignor of one-half to Charles B. Crampton, of same place..... 298,997

The electrodes are zinc and carbon. Chromate of lead is used in contact with the carbon in a porous cup, as a depolarizing agent. The liquid is an alkaline solution.

Telephonic Receiving Instrument; José Dottin Husbands, of London, England, Assignor to the American Bell Telephone Co., of Boston, Mass..... 299,074

In Fig. 1 the armature *c* is a bent elastic strip or tongue of metal attached to the disc *b*, with its two arms extending across the field of the magnet *a*. Its ends *c'* are or may be secured to the part on which they rest. This elastic armature will vibrate



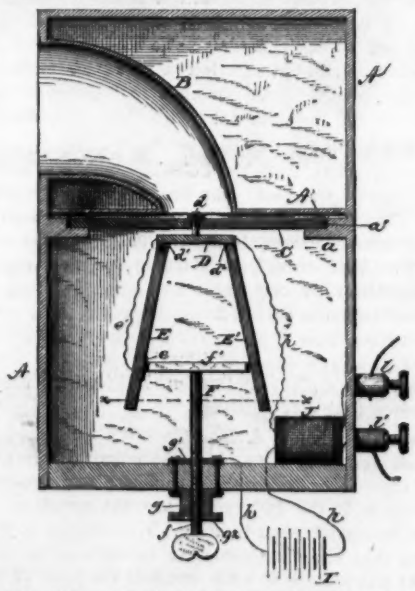
freely with and according to the variations of current in the magnet-coils, and will impart its vibrations to the disc *b* of the receiver. A similar action results from the modified arrangements shown in Figs. 2 to 7, in which is employed a hoop, ring, ellipse, semi-ellipse, or similarily-formed elastic armature *c*, so arranged, in combination with the disc *b* and magnet *a*, that the variations of strength due to the undulations of the current in the coils will act on the said armature, and thereby cause the vibrations of the disc.

Electric Block-Signal for Railways; Stephen James Swayze and John Clarence Lane, of Sag Harbor, N. Y..... 298,913

Consists of an electric-locking arrangement adapted for locking the signal-board in displayed position until the train that set it reaches the next signal-station.

Telephone Transmitter; Henry E. Waite, of New York, N. Y., Assignor to Charles F. Livermore, Trustee, of same place..... 298,923

F and the plate *f* constitute one electrode, and the leaves *E E'*



constitute the other. The latter is suspended from the diaphragm *C*. Adjustment is made by moving the electrode *F* up or down in obvious manner. *B* is the speaking tube.

Electric Multiple Switch-Board System; Theodore N. Vail, of Boston, Mass..... 299,039

Combination of details which enables the easy operating of a large number of circuits at a central telephone station.

Insulated Telegraph Tie-Wire; Charles J. Hinsdale, of Cleveland, O..... 298,753

The tie-wire in ordinary use has an insulating coating put on before use.

Mode of Operating Dynamo-Electric Machines; Thomas A. Edison, of Menlo Park, N. J..... 298,956

When two dynamos of unequal sizes are joined in multiple-arc to the one circuit, to prevent the smaller doing more than its share and so getting overheated, its electromotive force is lowered by any known means until the current it supplies is of the intensity suited to its size and proportionate duty.

Signal-Box for District and Fire-Alarm Telegraphs; Charles H. Carter, of Brooklyn, N. Y..... 298,945

Consists of the combination, with a fire-alarm or district-telegraph signal box of any approved construction, of an automatic switch device that is arranged in contact with the circuit-breaking wheel, and connected to a bell, or other signaling-device which repeats the signals of the circuit-breaking wheel.

Telegraph Pole; James Hunter, of Ruff's Dale, Pa.. 298,975

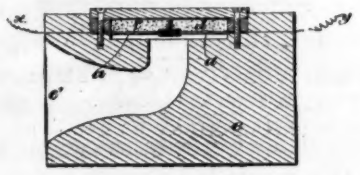
A metallic pole, which is so constructed as to clamp the cross-arms.

Telephone-Exchange System; F. Benedict Herzog, of New York, N. Y..... 299,070

An arrangement of details which enable the operation of a telephone common to a building. The main feature is a set of calls in the separate offices, any one of which calls may be operated whenever some one desires the occupant of an office to attend at the common telephone.

Telephonic Transmitter; José Dottin Husbands, of London, England, Assignor to the American Bell Telephone Co., of Boston, Mass..... 299,073

In the Fig. *a-a* are two separate sections of a disc. *b* is an insulating-piece placed between the edges of the sections. *c* is a chamber or recess containing carbon, which is in the form of



powder or fine grains *d*. *e* is the telephone-case; *e'* the mouth-piece, and *x y* are the respective terminals of the two electrodes.

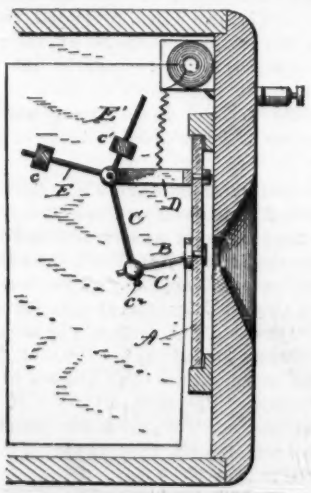
Its operation is as follows: The air-waves produced by speaking in front of the mouth-pice impinge on the said half-discs or plates and cause their vibration. The carbon is placed in the chamber and rests on the said plate *a a*, each of these plates being connected with one terminal of the circuit. The air-waves impinging on the said plates will, through the medium of the carbon, vary the resistance of the circuit, and thereby cause variations of the current in the line or circuit. The plates or halves *a a* of the disc are formed of thin iron or other suitable material.

Watchman's Electric Recorder; Jerome Redding, of Malden, Assignor to himself and Harvey Redding, of Everett, Mass..... 299,011

A clock dial with markers arranged around it. The markers are operated by closing momentarily electric circuits including them. The watchman is required to close these circuits in succession at proper times, and the marks made on the dial show the times when such closures were made.

Telephone Transmitter; Henry E. Waite, of New York, N. Y., Assignor to Charles F. Livermore, of same place..... 298,925

Relates to the manner of adjusting the electrodes of a telephone-transmitter, whereby they are adapted to be either brought into very delicate contact one with the other, so that their adjacent faces barely meet or touch, or to be forced together with a greater pressure, as may be desired; and it consists in providing one of said electrodes *B* with an arm *C* or arms having counter weights or balances *c c'* adjustable thereon back



and forth, whereby said electrode may be balanced with great accuracy and rendered capable of extremely delicate adjustment in connection with the other electrode.

Watchman's Electric Time-Detector; Christian G. Spengler, of Hoboken, N. J., Assignor to the Electric Patrol Indicator Co., of N. Y..... 298,906

Uses in an office a main time-piece and a number of electrical time-pieces, which are run through the agency of the main time-piece for definite periods only, and at the end of each of those periods become released from the control of the main time-piece. The watchman at distant points must at stated times operate instruments on the lines joining the primary and secondary time-pieces; failure to do so is indicated at the secondary time-piece on the line where the failure was made.